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THE NEANDERTHAL SKULL:

ITS PECULIAR CONFORMATION EXPLAINED ANATOMICALLY.

BY

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THE

NEANDERTHAL SKULL.

In the recent curious investigations, which are tending by fresh and more convincing evidence to push back to remoter periods man's autochthonous residence upon the earth, no human relics which have been brought to light have excited greater attention, or given rise to more speculation and discussion than the Neanderthal skull. Its remarkable forms have been supposed to afford a basis for that approximation to pithecoid conformation which appears to be much wanted for the better support of ingenious doctrines under consideration. Possibly it may have proved an allurement and a snare to the very accomplished men whose studies had prepared them for such a phenomenon. To one who has formed only a modest estimate of the worth of cranial forms, and who hesitates to put faith in the value often supposed to be inherent in them, the use of the Neanderthal calvarium as a key to unlock the hidden mysteries of nature, has been more surprising than convincing. In the present short communication it is not proposed to follow the very able and profound men of science who have treated of this skull in their researches, but merely to speak of the true meaning of the forms of the relic itself. If this can be definitively established, a great deal which has been based upon former estimates of them will fall to the ground, without the need of refutation; and the writer will be spared the, for him, improper position of pointing out the instability of the views of those far more thoroughly versed in these studies than he is.

At the period of the appearance of Mr. Busk's excellent translation of Professor Schaaffhausen's Memoir on the Neanderthal

Skull, to which he appended some remarks of his own*, my attention was attracted to the subject, by finding that I had in my possession a calvarium which struck me as having a great resemblance to this famous specimen, No. 1029 of my collection. It came into my hands some time ago with many other skulls which had belonged to a man who excited some attention in his day—Mr. Deville, the phrenologist, of the Strand, London. There is no history whatever attached to it, and nothing is known further of its origin. Yet there is no reason for thinking that it is anything more than a calvarium of a modern Englishman, which has been preserved for the singularity of its conformation; and it was probably a puzzle to its former owner. Soon after the appearance of Mr. Busk's translation, he favoured me with the briefest possible visit, when I had the opportunity to show him my specimen, and to place it in his hands. Shortly afterwards he exhibited it at one of the Soirées of the Royal Society of London, but I am not aware that it excited any particular attention.

In the investigation of skull-forms, for whatever purpose they may be studied, due weight should be given to every kind and degree of deformative influence. Of these influences there are various kinds—morbid, developmental, artificial, posthumous, of different species. None are more fertile in producing deformities, often of a very curious and bizarre appearance, than *synostosis*, or the premature ossification of one or more of the sutures between the cranial bones. The calvarium is liable to the invasion of this deforming influence from the earliest period of life. From it results, immediately, an arrest of the development of the brain in the position of the suture itself, and, remotely, an increased development at some other point where the sutures are open and allow expansion. A more precise law has been educed by the investigations of Professor R. Virchow, that, by the too early ossification of a suture, the development of the skull is arrested in the diameter perpendicular to that suture†. This is a well-established general law, perhaps liable to some exceptions.

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* Natural-History Review, 1861, p. 155.

† It is not necessary to refer to more than the three principal writers on synostosis of the bones of the cranium. Virchow, Gesammelte Abhandlungen, 1856, ii. 891. Lucae, Zur Architectur des Menschenschädels,

It may be asked, what are the conditions of the sutures in the Neanderthal calvarium? and is there any sign of premature ossification, such as commonly alters the form of a skull? In Professor Schaaffhausen's description of the Neanderthal calvarium, it is stated that "the coronal and sagittal sutures are on the exterior nearly closed, and on the inside so completely ossified as to have left no traces whatever, whilst the lambdoidal remains quite open"*. The coexistence of sutures fully ossified, and others quite open, at once shows that these appearances are not those resulting from age or senile obliteration, but arise from an irregular development, or premature and abnormal ossification. By the politeness of Professor Huxley, I have been permitted to see the photograph of the side of the Neanderthal calvarium, sent him by its owner, Professor Fuhlrott, of Elberfeld. In this photograph there is no appearance of the coronal suture, or of any suture in the temporal region, although the lambdoidal is very obvious. Professor Huxley was good enough to examine his cast of the calvaria, and to inform me that the traces of the coronal suture "are so faint that I can well understand their absence in the photograph." Lastly, Professor Fuhlrott himself has been so exceedingly kind as to comply with my request, to make a close investigation of the state of the sutures, and has favoured me with the following results:—"1. The *coronal suture*, on the external surface of the skull, is only obscurely perceptible on the left side for three inches, and on the right side for two inches, from the anterior extremity of the sagittal suture. Descending from these points, as well as on the internal surface of the skull, it has been entirely ossified, and is tracelessly vanished. The external coronal suture is, notwithstanding, found to be indicated in *all the figures* of the Neanderthal skull given in different works, even in that of Professor

1857. Welcker, Ueber Wachsthum und Bau des menschlichen Schädels, 1862. Ueber zwei seltnere Difformitäten des menschl. Schädels, 1863. To these illustrious anatomists the great merit is due of having devoted assiduous attention to the study of synostosis of the cranial bones, and of having given the subject the fullest elucidation. The law laid down by Professor Rudolf Virchow is expressed at S. 936. Professor Hermann Welcker has said of it, "Ich betrachte es als eine eben so unerlässliche wie dankbare Aufgabe unserer Wissenschaft."—Wachsthum, S. 14.

* Mr. Busk's translation of his work. Nat.-Hist. Rev. i. 157.

Huxley (Man's Place in Nature, p. 139)*. 2. The *sagittal suture* is both externally and internally untraceable, from ossification; still, on the outer surface, its direction is marked by a gentle depression. 3. The *lambdoidal suture* is very plain, both externally and internally, and runs in the normal manner on the right side to the *pars mastoidea* of the temporal bone, and here, so far as it is formed by the parietal bone, exists in a perfect state, whilst on the left side it appears somewhat defective. 4. Of the *squamous suture,* the middle portions on both sides of the skull are obviously present, upon the parietal bones. 5. Of all *the other sutures,* namely those taking their course on the points of examination on the frontal, parietal, and squamosal bones, there is nothing to be found, even no partial indication, 'einseitige Andeutung.'" This careful account of the state of the sutures in the original calvaria, which I owe to the great attention of its polite owner, comes fully to confirm the impression I had been *previously* led to entertain from a study of the subject, that the Neanderthal skull is simply an abnormal example, and owes its peculiar forms to synostosis of the cranial bones before the calvarium had attained its full development.

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* I regret that I am not able to give a correct figure from the photograph of Dr. Fuhlrott, which would have rendered it unnecessary to point out the defects of former representations. In the plate accompanying Professor Busk's translation of Schaaffhausen's Memoir, the coronal suture is depicted as abbreviated in the temporal region, in the profile, fig. 1. The lambdoidal suture is wholly absent in this figure. In fig. 2 (the vertical view) the coronal is represented as quite in its patent, normal state of serration; and the lambdoidal is seen less distinctly (Nat.-Hist. Rev. 1861, vol. i. pl. 4). In the outline cut of profile in the Memoir of Mr. C. Carter Blake, the coronal suture is made to run across the middle of the calvaria, and a little way down below the *linea semicircularis*; and there is no trace whatever of the lambdoidal suture (The Geologist, 1862, vol. v. p. 206). In the profile given by Professor Carl Vogt, the coronal suture is delineated as quite distinct, very nearly as far as the *linea semicircularis*; whereas in the bone itself it is only "obscurely perceptible" for three inches on this side. In the vertical view of this author, this suture is represented as running entirely across the calvaria, without any obliteration whatever. In both figures the lambdoidal is seen to be quite open (Vorlesungen über den Menschen, 1863, B. ii. S. 74, 75). In the profile figure of Sir Charles Lyell's work, there is an entire absence of all trace of the coronal suture, and the lambdoidal is represented very faintly, too faintly (Antiquity of Man, 1863, p. 82). It may be added that all these figures allow the sagittal suture to be obliterated, and the vertical view of Professor Vogt furnishes the depression described by Dr. Fuhlrott. Lastly, in the lithographic plate accompanying Professor Wm. King's article, the coronal suture is represented on the right side, in the profile, as decending to the *linea semicircularis*, and, in the vertical view, as in its normal open state, the lambdoidal in both figures being patent; but at the same time the sagittal also appears as open (The reputed Fossil Man of the Neanderthal, Quart. Journ. of Science, 1864, p. 88).

The premature ossification of the sutures of the temporal regions, the sides of the coronal suture, and those surrounding the alisphenoid prevents the proper development of the anterior lobes of the brain, and impels the cerebral substance backwards. In the skull itself it gives rise, immediately, to a narrow, low, contracted frontal region, and, indirectly, to the expansion of the calvarium in a posterior direction, where the sutures are open and allow of cerebral growth. In fact it influences the frontal region pretty much in a reverse manner to the presence of a permanent frontal suture, which facilitates the development of the anterior lobes of the brain and thus occasions an increased size of the skull in this part*. The premature ossification of the sagittal suture operates in a similar manner. It contracts the calvarium transversely, often occasions a *carina*, or ridge, in the situation of the closed suture (sometimes, as in this Neanderthal example, a depression), and compels the brain to grow and push outwards the cranial bones at some other point, where there is less resistance—commonly in the frontal and occipital regions, so as to give rise to the *scaphocephalic* calvarium. But in cases in which the sagittal suture is not closed, the obliteration of the spheno-frontal, parietal, and squamosal sutures, which often carries that of the sides of the coronal with it, I am satisfied gives rise to an elongation of the calvarium. To this we may aptly apply Dr. Welcker's designation *dolichocephalus synostoticus*. This ossification has a material influence (sometimes with that of the sagittal suture, where it operates most potently, and sometimes without) in producing the dolichocephalism of the skulls derived from the long and chambered barrows of the ancient Britons; for it is a remarkable fact, not yet explained, that these skulls are found to be specially obnoxious to synostosis[*].

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* The *brachycephalia frontalis* of Professor Welcker, who has treated this subject very satisfactorily, 'Wachsthum,' S. 87. The figures on Tafel v. of Professor Lucae's 'Architectur' may be referred to for a certain degree of confirmation. The forehead is greatly depressed, with a groove above the large superciliary ridge. The ossification of sutures is not precisely the same as in the Neanderthal example, but they agree in the principal synostosis, namely that which has obliterated the sides of the coronal suture.

In the application of these remarks to the famous Neanderthal calvarium, the first striking peculiarity that demands attention is the great magnitude of the frontal sinuses, and the enormous ridge of bone covering them, which are not affected by irregularity in the ossification of sutures. The size of these sinuses differs greatly in different persons, and to have them remarkably large is merely an individual peculiarity[†]. Some living persons, among Englishmen, might be brought forward exhibiting this peculiarity. And in the example figured No. 1029 the same peculiarity will be seen to exist. Still it should be remarked that the unusual depression of the frontal bone above the superciliary ridges gives an exaggerated prominence to this part in the Neanderthal calvarium. This depression, only slightly diminished in degree, will be seen in the example figured. The fact of its being less is at once explained by the open state of the sutures surrounding the alisphenoid, all of which appear to have been prematurely ossified in the Neanderthal skull.

It is precisely this early synostosis of the bones forming the temporal regions that has prevented the development and arching of the frontal bone, and given rise to the *great* depression and flatness of this bone, one of the most remarkable features of the Neanderthal calvarium[‡]. Indeed, it is the enormous superciliary ridge and the depressed forehead which have led so many excellent observers to the verge of a declination towards pithecoid forms.

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[*] There is a probability that the earliest examples of human crania obtained from these barrows were synostotic, and also deformed in the same way as the Neanderthal calvarium. At all events, one of the most striking peculiarities, which impressed Sir Richard Colt Hoare and his friends with the greatest force, was the "*fronte valde depressa.*" See Archæologia, vol. xix. p. 47.

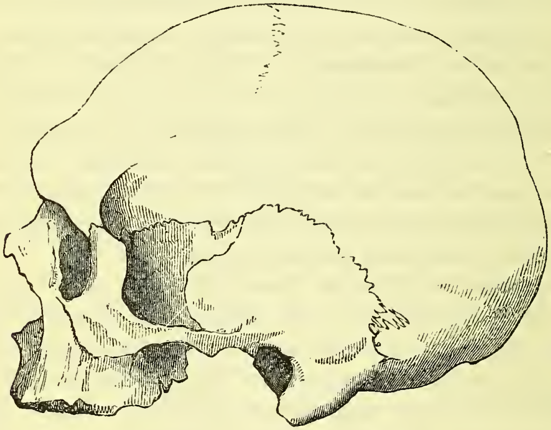
[†] "Ast sinus frontales, tam quod ad magnitudinem et extensionem, quam quod ad figuram, mirum quantum in diversis capitibus variant. * * * in aliis ad anteriora magis protuberantes, ut arcus superciliares sub fronte ipsa multum exstarent."—Blumenbach, De Sinibus Frontalibus, 1779, 4to. p. 3.

[‡] That is, in addition to the ossification of the coronal suture. This latter alone gives rise to the *Platycephalus*, Flathead, of Virchow and Lucae. The *Tapeinocephalus* of the latter is defined, "Synostosis between the frontal bone, the parietal bone, and the temporal bone" (*opera citata*).

In these particulars, and in the great gap, separating it from the body of the frontal bone, the Neanderthal calvaria may be said, at first view, to be suggestive of the crest of the Gorilla. But there is no real resemblance between the two; for the latter crest is a solid buttress of bone, and does not correspond to the hollow superciliary ridge. It will thus be seen that there is nothing either of a simious character or that might not have been expected in the low forehead of the Neanderthal skull, in which the brain had to grow and expand under a plate of bone which appears to have been in a great degree in one solid piece. It was impossible to raise this plate of bone upwards; and the result, as will be seen, was a development in another direction. In the middle region of the calvaria, the sagittal suture being closed, the contained cerebral substance could only expand at the sides, in the situation of the squamous sutures; and here the Neanderthal calvarium seems not to lack development. But in the posterior region its greatest expansion took place, precisely because in this part was the open lambdoidal suture, which admitted of the growth of the brain. In the figures of this imperfect calvarium the superior occipital scale is seen to be bulged out, and the whole of what remains of the occipital bone is full and large—the compensatory result for the contracted anterior regions.

The extreme length of the Neanderthal calvarium is given by Professor Huxley, and is eight inches, which is a very unusual length. In skulls in which such a length occurs, it is most frequently the result of synostosis. That such is the case in the Neanderthal example there is not any doubt. This feature is the unequivocal effect of premature ossification of longitudinal sutures.

I have no intention to enter into the question of the antiquity of the Neanderthal calvarium, a question which rests on other grounds than the anatomical considerations I have been led to discuss. It seems highly probable that an extreme antiquity belongs to the remains; but the peculiar conformation which the calvarium presents cannot justly be adduced as an argument in favour of this antiquity, for synostotic calvaria of like conformation, and only differing in *degree*, or in some modification of form, do occasionally occur, and that among modern races. I have confined myself to the anatomical question of the meaning of the peculiar form of this Neanderthal example, which I am satisfied is the result of synostosis, and is not in any way to be regarded as a race-character. Hence I am constrained to differ altogether from the learned Bonn Professor, who, in his able memoir, which gave the earliest impulse to the fame of this calvarium, stated his first conclusion, from anatomical examination, to be: "That the extraordinary form of the skull was due to a natural conformation hitherto not known to exist, even in the most barbarous races" *. On the contrary, I should say that the form of the calvarium is owing to an abnormal development, which is not, and cannot, be considered a race-character at all, but which is not, in one degree or another, an unfrequent occurrence among all races, and that this abnormal development presents a great variety of degrees and modifications, according to the particular combinations of sutures which are ossified. It is probable that there might be much difficulty in pointing out any individual calvarium of exactly the same form as the Neanderthal example, whilst there is not the least in finding those whose forms have been modified in various ways by the same cause, and which resemble, more or less closely, the Neanderthal skull. As already



Calvarium of Englishman, No. 1029 (*nearly one-third the natural size*). The coronal, lambdoidal, and sagittal sutures are ossified. The spheno-malar, frontal, parietal, and squamosal sutures are all quite open.

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* Nat.-Hist. Rev. vol. i. p. 155.

stated, it was soon after the appearance of Mr. Busk's translation of Professor Schaaffhausen's memoir, that I was impressed with the resemblance of a calvarium in my own collection to that of the Neanderthal cavern. And it has been the study of this specimen that has led to the attribution of the peculiar forms of the latter to their true cause.

This enormous example of a modern English calvarium, which has undergone modifications of its natural form by abnormal synostosis, may be briefly described. It is that of a man who has attained the middle, if not a later period of life—perhaps sixty years. It is of unusual dimensions, thick, large, and heavy, weighing, in the absence of all teeth, 40½ ounces av., or 1146 grammes. It has an immense superciliary ridge running entirely across the frontal bone, and a low, receding forehead behind it, an obvious depression being seen in the line of the profile connecting the two, as in the Neanderthal specimen. Although the vertex is not high, the calvarium is wide in the interparietal diameter, and both it and the Neanderthal one are full in the supraoccipital region, and long. It measures 8 inches in diameter from a point just above the superciliary ridge to the external occipital protuberance; hence it is rather longer than the Neanderthal example. Its other measurements, given according to the method I have followed*, are these:—

A. Internal capacity in ounces of dry Calais sand, 94 ounces avoirdupois = 113 cubic inches, = 1851 cubic centimetres.

B. Circumference	22·8	inches	= 578	millimetres.
C. Fronto-occipital arch	16·6	,,	= 421	,,
a. Frontal portion	5·8	,,	= 147	,,
b. Parietal portion	5·2	,,	= 133	,,
c. Occipital portion	5·6	,,	= 143	,,
D. Intermastoid arch	16·9	,,	= 429	,,
E. Length	8·0	,,	= 202	,,
F. Greatest breadth, which is intertemporal	6·3	,,	= 159	,,
a. Frontal	5·1	,,	= 130	,,
b. Parietal	5·5	,,	= 140	,,
c. Occipital	4·8	,,	= 122	,,

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* This method is fully described in the 'Crania Britannica,' chap. viii.

G. Greatest height	5·7 inches	= 145 millimetres.	
a. Frontal height	5·3 ,,	= 135 ,,	
b. Parietal height	5·5 ,,	= 140 ,,	
c. Occipital height	4·9 ,,	= 125 ,,	
I. Face, width of	5·9 ,,	= 149 ,,	
J. Ratio of E length, as 100, to breadth			78
K. ,, ,, ,, to height			71

This enormous calvarium does not agree very closely in its form with the Neanderthal example; it is not so depressed in the frontal and vertical regions; but it owes its peculiar conformation to precisely the same cause—irregular and premature ossification of the sutures. And the points in which it agrees, as well as those in which it disagrees, with the Neanderthal calvarium, admit of ready explanation by a close reference to the points of obliteration of sutures in which they agree or differ. In this example the coronal suture is not at all to be traced externally for the lower half of its course on each side, and even the middle portion is almost entirely effaced. Internally there is no trace of it remaining. But the sutures surrounding the alisphenoids are all quite open. Upon this difference from the Neanderthal fragment is based its deviation from the greater, extreme depression of the frontal in the latter. The premature ossification of the coronal suture has prevented the growth of the anterior lobes of the brain upwards and laterally, to a certain extent—but not wholly, because the side sutures below were open. And pretty much the same has occurred in the middle region of the calvaria, where the sagittal suture is firmly ossified, whilst the squamous sutures are both of them patent and free. Hence the brain has been arrested in developing itself vertically, and would, as is the usual course in such cases, have been impelled backwards, so as to elongate the skull considerably, had it not been for the complete ossification of the lambdoidal suture. From this condition its expansion has been below in the temporal regions, where the squamous sutures are open in all their course.

With respect to the capacity of this calvarium, which is represented by 94 ounces of sand, equal to 113 cubic inches, or 1851 cubic centimetres; although it presents a frontal region so depressed or low in development, this capacity is unusually great, and the amount of cerebral matter contained in the skull must have been much above the average. The weight of the cerebral substance contained in it, after making an allowance of 5 ounces for the membranes and fluids, would have amounted to 63 ounces, or 1785 grammes. For a clearer estimation of these measurements, it may be added that Professor Morton found the mean average capacity of the skull in his Teutonic Family to be 93·5 cubic inches, and that the capacity of the largest skull in his great collection only exceeded this (No. 1029) by one inch—it was 114 cubic inches, this is 113*. The careful observations of Dr. Peacock led him to the conclusion that "the encephalon in the adult male weighs on an average 50 oz. 3·25 dr."†, or nearly 13 ounces less than in this example. Again, 1785 grammes would stand in the fifth place from the top in the late Professor Rudolph Wagner's long table of the weight of the brain in 964 instances, arranged from the highest to the lowest,—the brains of Cuvier and Lord Byron and two diseased brains alone standing above it‡. This shows how erroneous it would be to conclude, from the great depression of the frontal and vertical regions in a synostotic skull, that the individual has been endowed with a cranium of small size, or had a deficiency in the mass of his brain. And it will be equally seen, from what is declared, on the best authority, with respect to the Neanderthal skull, that the supposed evidence of unparalleled low and imperfect development of brain, reducing the Neanderthal man below the lowest existing human race in cerebral development, and all its ennobling results, is entirely without foundation. Professor Huxley states the horizontal circumference to be 23 inches, which will admit of a slight allowance being made for the inevitable swelling of the plaster cast, upon which his measure was taken, without reducing it below the large example now adduced, or 22·8 inches. Professor Schaaffhausen states that the capacity of the fragment, as it now exists, obtained by filling it with water, is equal to 1033·24 cubic centimetres, or 63 cubic inches. In its complete state, Professor Huxley considers that the Neanderthal calvarium

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* Table of the Measurement of 663 Crania of various Races and Families of Man, Meigs's Catalogue of Human Crania, 1857, p. 17.

† Tables of the Weights of some Organs of the Human Body, 1846.

‡ Morphologie und Physiologie des menschl. Gehirns als Seelenorgan, 1860, S. 39.

" could hardly have held less than an additional 12 cubic inches." My own impression, resulting from the gauging of a considerable number of skulls (from one to two thousand), is that it would have held much more, probably 30 additional cubic inches at least. If so, the capacity would have been equal to the average of Morton's Teutonic Family*.

After these remarks, it is almost unnecessary to refer to other examples of synostotic skulls ; yet it may be well to state that the calvarium figured above is the one bearing the closest resemblance to the Neanderthal example that has attracted my notice. It is a proof of the extraordinary changes the calvarium may undergo in its form from synostosis, and forcibly confirms what I have already said, that no correct estimate can be formed of cranial conformation, unless close attention be paid to all the causes of deformation, among which synostosis holds a chief place. Had this attention been paid at first to the Neanderthal fragment, and had the true nature of its unusual forms been accurately determined, the greater part of the conjectural ideas to which it has given rise would not have been based upon such an abnormal example†.

The whole subject of the periods at which the sutures become obliterated in an abnormal manner deserves to be much more fully investigated. The cases in which there is the greatest resulting deformation take their rise in very early life, most likely always during intra-uterine life. I have seen an exceedingly strongly marked case of true scaphocephalism, in which every feature of the abnormity was present, in a child between seven and eight months old, and feel quite unable to receive the mother's testimony that the boy's head was free from deformation at birth. So great an interference with the normal form as exists in the Neanderthal skull and in No. 1029 could scarcely have originated at a period later than fœtal existence.

I have probably been led to occupy too much attention with a subject already so fully discussed as the Neanderthal skull, of which Professor Huxley has observed, " it seems difficult to believe that there now remains very much more to be said"*. I hope to be excused when it is recollected that I have confined myself almost solely to its *anatomical characters.* I am not aware that these have been before determined. But when determined, they may be regarded as sufficient to prevent much further speculation, if not sufficient to refute a good deal already put upon record.

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* I perceive this view receives some confirmation from Professor Huxley's more recent experiments. Nat.-Hist. Rev., July 1864, p. 445.

† It would scarcely be proper to pass by the very judicious and sensible remarks of Dr. Turner, which are quoted from a memoir I have not seen, in the last Number of the Nat.-Hist. Review, by Professor Huxley, at pp. 441, 442, without recognizing them fully.

Professor Huxley and Professor Broca have both, with much judgment, opposed the notion that the Neanderthal calvarium has belonged to an idiot. There is no adequate reason for denying the full powers of mind belonging to his race, to the Neanderthal man—at least as far as the size of his brain is concerned; and there is truly no other basis for an opinion upon this subject. In favour of the conclusion that he belonged to a very inferior race, such as the Australian, I do not see any evidence. Indeed inquiries in this direction may be at once arrested, now that the true cause of the peculiar conformation of the Neanderthal calvarium has been pointed out and admitted. That the very ancient inhabitants of Europe, who had normal skulls, were much inferior in mass of brain, or other evidence of good cerebral organization, I am led to doubt. At all events, taking the evidence as it stands, and the ancient Britons as a fair example of such primeval races, there is no ground for regarding them in this respect as inferior to many modern Europeans†.

Shelton, Staffordshire,
August 1, 1864.

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* A complete enumeration of those who have already treated upon the Neanderthal calvarium would be difficult. Besides the eminent men already referred to, it would include Professor Welcker, Professor Carl Vogt (Vorlesungen über den Menschen, ii. 74, 317), the late Professor Rudolph Wagner, who, in one of his last writings, expressed the opinion that it might be nothing more than the skull of a modern Dutchman. The learned Dr. Prunerbey maintained that the Neanderthal calvarium was pathological. It has now, I believe, been proved to be abnormal. Professor Schaaffhausen, the original describer of the remains, is about to make a further contribution on the subject, in which he proposes to criticise the views of Professor Huxley.

† Crania Britannica, chap. viii. and ix. It should be explained that *cranium* is used for the whole of the bones of the head, in a complete state; *calvarium* for these bones, wanting the lower jaw; and *calvaria* for those of the vault of the brain-case alone. These distinctions are found to be convenient.

POSTSCRIPT.

Since what precedes was written, I have had an opportunity to examine the osteological collection of the celebrated and accurate Soemmerring, which is preserved in the Anatomical Museum of the University of Giessen. His attention has evidently been specially directed to anomalies of structure, as well as to morbid changes. He distinctly noticed the varieties in the sutures of the skull, as other anatomists have done, and the effects they produce in altering its form. One section of his Catalogue is entitled "Suturarum cranii varietates." In this Section he enumerates "148. Cranium puellæ venustissimæ Parisinæ viginti sex annorum. Sutura sagittalis obliterata," and adds, "hinc forma elongata." (Catalogus Musei Anatomici quod collegit Samuel Thomas de Soemmerring. 1830, p. 124.)

Professor G. S. Morton fully recognized the effects of premature obliteration of the cranial sutures. In a communication to the Academy of Natural Sciences of Philadelphia, made May 6, 1845, he exhibited the skull of a Congo Negro (No. 1224 of his 'Catalogue'), "who could not have been more than twenty years old; and yet," he says, "there is a total absence of the sagittal and coronal sutures, and the lambdoidal itself is not complete, while the temporal suture remains entirely open." After calling attention to a skull exhibited by him in 1841, nearly in all respects analogous, and the opinion he had deduced from it, that the principal function of the sutures is to subserve the growth of the bones (he might have added, and of the brain also), which they do by osseous deposition at their margins, he concluded by showing "that, owing to the total absence of the sagittal suture in the Congo Negro skull, the lateral growth of the cranium has ceased at an early period of life; the presence of the lambdoidal suture has permitted of posterior elongation, and, the squamous sutures being entirely open, the upward growth, corresponding to the lines of these sutures, is remarkably developed." (Proc. Acad. Nat. Sci. Philad. vol. i., August 1841, and vol. ii., May 1845, p. 232; 'Types of Mankind,' 1854, p. 303.)